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ABSTRACT

Two experiments, designed to examine the developmental changes in the modification of visual memory by verbal information, are described in this paper. In both experiments, first, third, and fifth grade children and college students were shown slides of short episodes followed by oral questions. Questions either described or did not describe events depicted in the slides. The first experiment indicated that correct recall of the visual events was facilitated by congruent verbal information and impaired by incongruent verbal information. The effects of verbal information were generally equivalent across age. The second experiment evaluated the effects of verbal information on visual recognition performance. Both the correct recognition of the original study slides and the false recognition of similar distractor slides increased when the questions presented information depicted in the appropriate slides. Again, the effects of oral information were generally unrelated to age. Since verbal and visual information was integrated by the subjects at all grade levels, this semantic integration was thought to occur spontaneously. However, when the subjects' recognition performance in the second experiment was made conditional on correct memory for the target slides, the integration of verbal and visual information increased with age. These results are consistent with the view that the utilization of constructive cognitive processes increases with age. (Author/MP)

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Integration of Visual and Verbal Information in Children's Memories

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Running head: Visual and Verbal Information

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Abstract

When adults are presented films or slides of events, it is often found that subsequent verbal information modifies their visual memories. The present two experiments were designed to examine the developmental changes in the modification of visual memory by verbal information. In both experiments, children from the first, third, and fifth grades, and college students were shown slides of short episodes followed by oral questions. Some questions described events depicted in the slides whereas other questions described events not depicted in the slides. In the first experiment, it was found that correct recall of the visual events was facilitated by congruent verbal information and impaired by incongruent verbal information. The effects of verbal information were generally equivalent across the grade levels. The second experiment evaluated the effects of verbal information on visual recognition performance. Both the correct recognition of the original study slides and the false recognition of similar distractor slides increased when the questions presented information depicted in the appropriate slides. As in the first experiment, the effects of oral information were generally unrelated to age. Since verbal and visual information was integrated by the subjects at all grade levels, this semantic integration was thought to occur spontaneously. However, when the subjects' recognition performance in the second experiment was conditionalized on correct memory for the target slides, the integration of verbal and visual information increased with age. These results are consistent with the view that the utilization of constructive cognitive processes increases with age.

Integration of Visual and Verbal Information in Children's Memories

In a recent series of studies, Loftus and her colleagues (Cole & Loftus, 1979; Loftus, 1975, 1977; Loftus, Miller, & Burns, 1978; Loftus & Zanni, 1975) demonstrated the interdependence of visual and verbal memory in adults. In a typical experiment, adults were shown films or slides of events such as automobile accidents or classroom disruptions, and then were asked a number of questions. Some of the questions referred to information that had actually appeared in the films or slides, while other questions referred to events or scenes that had not appeared, but which were thematically consistent with the depicted events. When answering the questions, the subjects tended to report that they had in fact seen the incorrect but thematically congruent information.

Such results indicate that adults will use reasonable and consistent verbal information to elaborate, enrich, or interpret visually experienced events. The results are also consistent with the view that adult memory is interactive and constructive rather than passive and static (Bartlett, 1932; Bransford & Franks, 1971; Carmichael, Hogan, & Walter, 1932; Paris & Lindauer, 1977). In contrast to the work with adults, little evidence is available on whether children's visual memory interacts with verbally presented information to the same extent as adults. The available evidence on the development of constructive memory processes indicates that children are less likely than adults to engage in a variety of constructive activities related to improving memory (Kail, 1979; Ornstein, 1978). Such evidence suggests that children's visual memories ought to be less susceptible to the influence of misleading questions than adult visual memory.

The purpose of the present study was to use the paradigm developed by Loftus to compare the extent to which children and adults would spontaneously incorporate verbal information into visual memory. The Loftus paradigm has a specific advantage over other paradigms concerned with the development of memory processes. Memory performance in many paradigms is strongly influenced by whether subjects deliberately employ mnemonic strategies. The advantage of the Loftus paradigm is that the incorporation of verbal information into visual memory appears to occur independently of intelligence and verbal abilities (Powers, Andriks, & Loftus, 1979) and apparently without conscious effect (Cole & Loftus, 1979; Loftus, 1975, 1977, 1979).

In Experiment 1, 54 children from each of the first, third, and fifth grades and adults were shown several series of slides, where each series told a particular "story". After each story was presented, the subjects were orally asked questions concerning the story. Some of the questions contained references to events that were depicted in the slides and some questions referred to events not depicted in the slides. Later questions were designated as "follow-up" questions and were designed to examine whether the information contained in previous questions influenced the subject's memory of the depicted visual events.

The correct answers to the questions containing the information were analyzed as a function of grade level and information type (correct, none and misleading). The analysis of variance revealed that the only significant effect was an improvement in recall with grade. Although correct recall increased with grade level, there were no significant differences within each grade in correct recall as a function of information type. Apparently the presentation of the information did not affect the difficulty of the questions.

The analyses of the follow-up questions revealed correct responses increased with grade level and that correct responses were significantly affected by the type of information. The mean correct scores are presented in Figure 1. As can be seen from the Figure, exposure to congruent visual and verbal information improved recall performance whereas exposure to incongruent visual and verbal information impaired recall performance.

In the second experiment, a recognition procedure was utilized because it has been argued that recognition tasks are relatively free of developmental changes in the involvement of memory retrieval strategies compared to recall tasks (Brown, 1975, Perlmutter & Lange, 1978). The present procedure consisted of three phases. The first was a study phase in which a series of slides was presented to 30 subject from each of the first, third, and fifth grades, and adults. In the second phase the subjects were asked oral questions about the slides in order to expose them to verbal information. The final phase was a recognition task in which the subjects were presented with the original target slides and distractor slides. Some distractors were slides which depicted characters different from those depicted in the study slides and other distractor slides depicted characters and events similar to those depicted in the study slides.

The verbal information presented in the second phase of the experiment was relevant to both the target and distractor slides. In some questions verbal information was presented that described the characters and events depicted in the study slides. Other questions in the second phase of the experiment described characters and everts depicted in the related distractor slides.

The percentage of correct responses in the recognition task were analyzed

separately for number of study slide hits and for correct rejections of distractor slides. Both the hits and rejections were analyzed in terms of performance on all recognition trials and only on those trials in which at least two study slides (in the no information condition) were correctly recognized. The conditional analysis was designed to examine recognitin performance when memory of the study slides was roughly equivalent across the subjects. Because of the possibility of developmental changes in response criterion, signal detection analyses were used to calculate d's for the correct recognition of the study slides and the correct rejection of the related distractor slides. The inverse of the mean correct rejection of the unrelated distractors was used as an estimate of the false alarm rate in subsequent signal detection analyses.

The mean d's for the correct recognition of the study slides are presented in Figure 2. Analyses of the data revealed that correct recognition increased with age, that the information slides were more easily recognized than the no information slides, and that performance was better on the conditional data than on the nonconditional data. Also, the analyses of the conditional data revealed a significant interaction of grade level and information type.

The mean d's for the correct rejection of the unrelated distractors are presented in Figure 3. The analyses of the data revealed the same significant effects obtained in the correct recognition analyses (except that the presentation of verbal information about a distractor decreased the probability of correct rejection).

The present two experiments revealed that the verbal information influenced both the recall and recognition of previously presented visual

material of the subjects at every grade level. Verbal information congruent with the visual information was found to increase correct recall of visual events (Experiment 1) and correct recognition of slides (Experiment 2). Incorrect verbal information decreased correct performance on both the recall and recognition tasks. These findings are evidence that the influence of verbal information on visual memories does not rely on deliberate acquisition of retrieval strategies (cf. Brown, 1975). Instead, the presentation of meaningful sequences of pictures apparently allowed subjects to generate relationships in which verbal information can be easily incorporated. More generally, the present results suggest that children can in fact use constructive processes in a context where the processes can be generated and use spontaneously. A similar conclusion has been reached in studies of children's semantic integration (e.g., Barclay & Reid, 1974; Brown, 1976; Paris, 1975, 1978).

When the effects of verbal information were conditionalized on correct recognition in the second experiment, children were found to be less likely to use verbal information to modify visual memories than adults. Thus, the conditional scores indicate a developmental increase in the amount of integrative activity engaged in. Since the recognition criterion was designed to measure the effect of verbal information on well-formed visual memories, it is possible that the integration of verbal and visual information is affected by the quality of the visual memory. In particular, the integration of verbal information into well-formed visual memory may be the result of deliberate strategies whereas the use of verbal information occurs spontaneously when visual memory is poor. A similar suggestion has been made by Paris and his associates (Paris, 1975; Paris & Lindauer, 1976) who argued that some developmental increases in the use of inferences are due to deliberate memory activity.

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Table 1

Examples of Information and Follow-up Questions Presented in Experiment 1

Mighty Mouse	
No information:	How was the mouse caught by the cat?
Correct information:	When the mouse was walking along the road, how was it caught by the cat?
Misleading information:	When the mouse was walking along the beach, how was it caught by the cat?
Follow-up questions:	Was the mouse wearing shoes? Was the mouse barefooted?
Charlie Chan	
No information:	Who caught the vase after the thief threw it away?
Correct information:	After Chan pointed to where the thief was hiding, who caught the vase when the thief threw it away?
Misleading information:	After the quard pointed to where the thief was hiding, who caught the vase when the thief threw it away?
Follow-up questions:	Did Chan open the mummy case where the thief was hiding? Did the quard open the mummy case where the thief was hiding?
Hong Phooney	
No information:	What happened after Hong Phooney read the newspaper?
Correct information:	What happened after Hong Phooney stopped sweeping the floor and read the newspaper?

Misleading information: What happened after Hong Phooney stopped mopping the floor and read the newspaper?

Follow-up questions: Was Hong Phooney holding a broom when he picked up the newspaper?

Was Hong Phooney holding a mop when he picked up the newspaper?

Krog

No information: When the bear appeared, where did it chase the men?

Correct information: When the bear appeared and broke the man's spear, where did it chase the men?

Misleading information: When the bear appeared and broke the man's fishing pole, where did it chase the men?

Follow-up questions: Were the men hunting when the bear appeared?

Were the men fishing when the bear appeared?

Speed Buggy

No information: Why did the speed buggy did the tunnel?

Correct information: After the speed buggy drove itself to the fire, why did it dig the tunnel?

Misleading information: After the men drove the speed buggy to the tunnel, why did it dig the tunnel?

Follow-up questions: Did the speed buggy start itself to dig the tunnel?

Did the men start the speed buggy to dig the tunnel?

Archie

No information: Who drove away in Archie's car?

Correct information: After Archie finished fixing his car, who drove away in it?

Misleading information:	After Archie finished painting his car, who drove away in it?
Follow-up questions:	Was Archie holding a screwdriver when he was working on his car?
	Was Archie holding a paintbrush when he was working on his car?

Scooby

No information	How many cars fell off the back of the truck?
Correct information:	When scooby and his friends were walking by, how many cars fell off the back of the truck?
Misleading information:	When Scooby and his friend were walking by, how many cars fell off the back of the truck?
Follow-up questions:	Did Scooby have more than one friend with him?
	Did Scooby have only one friend with him?

Table 2

Examples of Information Questions Presented in Experiment 2 Relative to Slide Type

Information Condition	
None.	Did Luke and his friends escape from the robot guardsmen?
Target.	After the robot guardsmen fired at Luke and his friends, did Luke and his friends escape?
Distractor.	After the robot guardsmen demanded that the men "halt," did Luke and his friends escape?
None.	What did Obe-Wan kenobi give Luke?
Target.	After Luke and Obe-Wan kenobi see the message given by the R-Z unit, what did Obe-Wan kenobi give Luke?
Distractor.	After Luke was helped to his feed by Obe-Wan kenobi, what did Obe-Wan kenobi give Luke?
None.	What did the robots do to the princess?
Target.	After the robots attacked and searched the space ship of the princess, what happened to the princess?
Distractor.	After the robots shot the guards protecting the princess, what happened to the princess?
None.	Was Luke seriously injured by the brown raiders?
Target.	After the brown raiders overwhelmed Luke and his ship, was Luke seriously injured?
Distractor.	After Luke was seized by the brown raiders, was he seriously injured?

None. What were Darth Vader and Obe-Wan kenobi fighting with?

Target. What were Darth Vader and Obe-Wan kenobi fighting with when Obe-Wan told Luke to run?

Distractor. What were Darth Vader and Obe-Wan kenobi fighting with when the robot guards were watching?

None. What did the men think the space station was?

Target. Before the spaceship was drawn inside the large white space station, what did the men think the space station was?

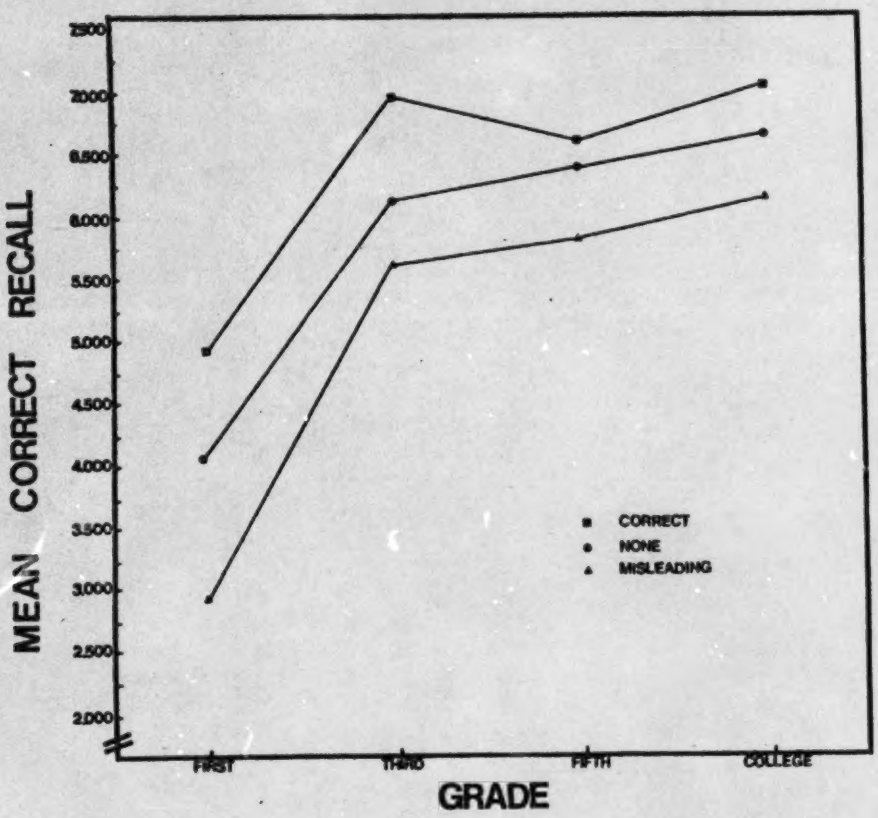
Distractor. Before the spaceship was forced to the space station by the red tractor beams, what did the men think the space station was?

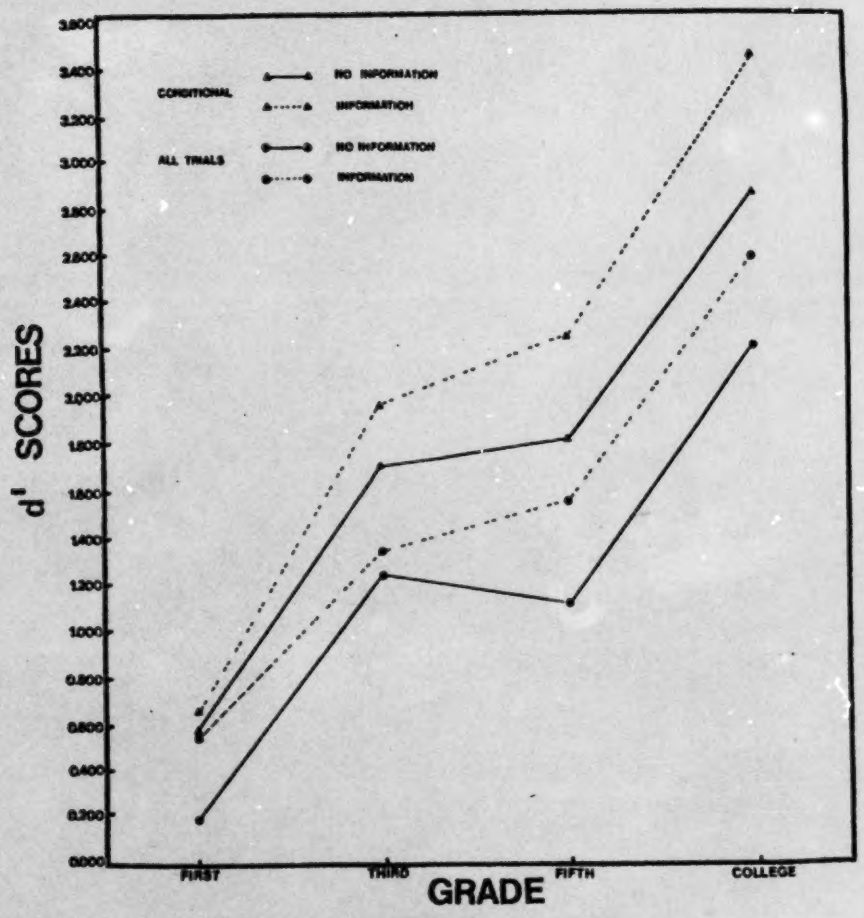
Figure Caption

Figure 1. Mean recall correct as a function of grade level and information condition.

Figure 2. Mean d' scores on the correct recognition of the target slides.

Figure 3. Mean d' scores on the correct rejection of the distractor slides.


MEAN CORRECT RECALL
7.500
7.000
6.500
6.000
5.500
5.000
4.500
4.000
3.500
3.000
2.500
2.000
FIRST
THIRD
FIFTH
COLLEGE
GRADE
CORRECT
NONE
MISLEADING


CONDITIONAL
NO INFORMATION
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d' SCORES
FIRST
THIRD
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COLLEGE
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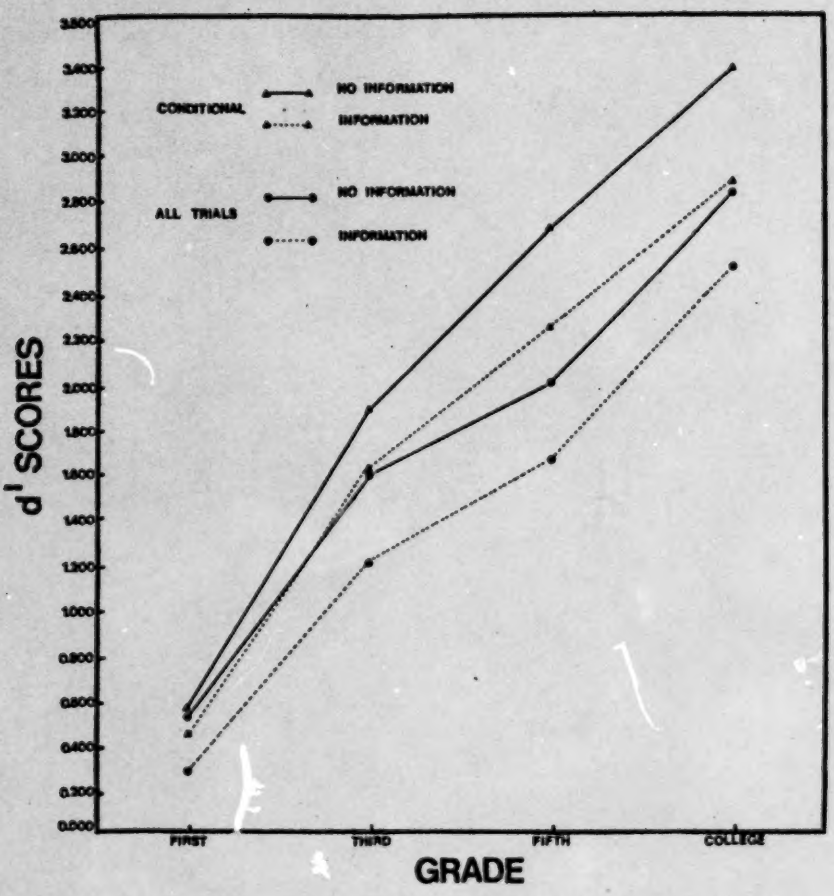
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